

## CLAIMS

1. A solid state brachytherapy applicator for performing radiation therapy treatment in an animal body, said applicator at least comprising an x-ray emitting surface composed of:

a vacuum cavity containing a cathode and an anode spaced apart at some distance from each other;

emitting means for emitting free electrons from the cathode;

10 electric field means for applying during use a high-voltage electric field between said cathode and said anode for accelerating said emitted free electrons towards said anode; wherein

said vacuum cavity being at least partly transparent to X-ray radiation emitted by said anode, **characterized in that** said vacuum cavity is bound by first and second plate-shaped elements spaced some distance from each other, said first plate-shaped element serving as cathode and said second plate-shaped element serving as anode.

2. Solid state brachytherapy applicator according to claim 1, **characterized in that** between said first and second plate-shaped elements spacers of high insulating material are present.

3. Solid state brachytherapy applicator according to claim 1, **characterized in that** a getter material is provided on the surface of said first plate-shaped element facing away from said second plate-shaped element.

25 4. Solid state brachytherapy applicator according to claim 3, **characterized in that** said first plate-shaped element is provided with at least one opening exposing said getter material to said vacuum cavity.

5. Solid state brachytherapy applicator according to claim 1, **characterized in that** said vacuum cavity is shaped having a complex, spatial geometry.

30 6. Solid state brachytherapy applicator according to claim 5,

**characterized in that** the solid state brachytherapy applicator is connected to a distal end of a guiding wire for insertion towards said desired location within an animal body.

7. Solid state brachytherapy applicator according to claim 1,

5 **characterized in that** said first plate-shaped element serving as cathode is of a gated field emission type containing a ferro-electric electron emitting material or carbon nanotubes.

8. Solid state brachytherapy applicator according to claim 7,

10 **characterized in that** said ferro-electric electron emitting material is positioned between a lower electrode and an upper electrode, both electrodes being connected to a driving voltage.

9. Solid state brachytherapy applicator according to claim 8,

15 **characterized in that** said lower electrode is build up from several electrode segments, the segments of said electrode being electrically isolated from each other and each separately being connected to said driving voltage.

10. Solid state brachytherapy applicator according to claim 9,

**characterized in that** said electrode segments of said lower electrode are each separately connected to said driving voltage via a multiplexer.

20 11. Solid state brachytherapy applicator according to claim 8,  
**characterized in that** said upper electrode is constructed as an electrically conductive sheet provided with a large number of openings serving as emitting holes for the emitted free electrons.

12. Solid state brachytherapy applicator according to claim 11,

25 **characterized in that** said openings have a polygonal shape, for example round, square, hexagonal, etc.

13. Solid state brachytherapy applicator to claim 8,

30 **characterized in that** said upper electrode is constructed as at least one electrically conductive frame in which a large number disc shaped elements partly is fixed on the ferro-electric electron emitting material.

14. Radiation therapy treatment system for performing radiation therapy treatment in an animal body at least comprising:

a doses planning device for preplanning a radiation therapy treatment within said animal body using a solid state brachytherapy applicator according to any one of the preceding claims;

control means for driving said solid state brachytherapy applicator according to the preplanned therapy treatment; and

one or more radiation detectors positioned in the near vicinity of said source device in said animal body for measuring the actual radiation dose distribution generated by said solid state brachytherapy applicator, and wherein said radiation therapy treatment system is arranged for delivering feedback information to the control means to adapt the dose according to the preplanned treatment parameters.

15. Method for performing radiation therapy treatment in an animal body using a radiation therapy treatment system according to claim 14 and a solid state brachytherapy applicator according to claim 1.